CISE Response to
Committee of Visitors FY 06 Report
National Science Foundation
Computing and Communications Foundation Division
June 15-16, 2006

We find the Committee of Visitors Report to be thorough, comprehensive, fair, and constructive. The Committee has analyzed the division in depth and has provided an evaluation with respect to the criteria provided to them. The Committee has also provided helpful recommendations on merit review, management of the division, and allocation of resources. Finally, they have provided excellent recommendations for measuring the impact of NSF's investments and for making those measurements available to future evaluating committees. We greatly appreciate their hard work and perceptive analysis.

The Committee delivered an overall report for the division together with detailed reports on each of the clusters in the division. The report, as a whole, has been very positive and supportive, for which we are most grateful. We intend to take specific measures to address their concerns, adopting nearly all of their recommendations. Below are our responses to specific recommendations found in the report. The responses are organized by topic and preceded by underlined quotations from the COV report on that topic.

Quality and Effectiveness of Merit Review Procedures

Overall, the COV believes that the review-panel process is excellent and the decision time has consistently met the NSF goal….

We are delighted that the COV has judged our review process to be excellent, and will continue to improve the process. The comments that follow will provide guidance in our improvement.

The COV observed, however, that some reviews are uninformative in terms of providing useful feedback to proposers. The COV believes that this lack of informative reviews may be addressable by organizing highly-focused panels, by providing targeted ad hoc (or mail) reviews for specialized areas, and by providing the Program Directors feedback to proposers.

We agree that reviews are not always as informative as they could be. We are addressing this through changes to the review and documentation procedures which we expect to result in better feedback to investigators. Changes include more rigorous standards for

documentation of decisions, with program director comments to the investigators in some cases.

Whereas the intellectual-merit criterion has generally been implemented appropriately, the broader-impacts criterion appears not to be well understood by either proposers or reviewers. The review comments provided by individual reviewers and by the panel summaries are often superficial and not relevant. In contrast, Program Directors do a better job of addressing this criterion in their assessments, but these comments are not always available to proposers. The COV believes that greater clarity in describing the broader-impacts criterion to proposers and reviewers would be helpful in improving the overall implementation of the merit review criteria. Although the NSF Website does provide an extensive description, the community still appears to be missing the point of the broader-impacts criterion.

As part of our changes to the review procedures, we have produced guidelines for reviewer or panelist instructions. These guidelines include a discussion of the broader-impacts criterion. In cases where the program director needs to communicate concerns about broader-impacts to the proposer, the program officer comments provide a vehicle.

Selection of reviewers. The number of reviewers per proposal is adequate. The appropriateness of the reviewers is largely good, but it is somewhat uneven in some areas, such as Theory of Computing in the Theoretical Foundations cluster, where more focus is desirable (see TF Cluster Report, A.1). The COV believes it would be helpful to let reviewers rate their level of confidence/expertise for each proposal they review as is commonly done in other peer-review venues. This rating could help guide assignment of proposals to reviewers and signal the need for additional reviews of particular proposals.

A self-rating system of this type is under consideration as a change to the review procedures. The same purpose may also be served by a current practice of many program directors, in which panelists can indicate their expertise and confidence with respect to individual proposals as input to the program director's process of assigning proposals. The effectiveness of this practice will be shared more broadly with CISE program directors.

As mentioned by one unhappy panelist and experienced by four TF subcommittee members, in some panels, the panelists were asked to adjust the ratings of their reviews to align them with panel recommendations. The TF subcommittee views this practice as inappropriate.

It is customary for CISE program directors to ask panelists if they wish to modify their individual reviews for a proposal, IF their perspectives on the proposal have been influenced or informed by the panel discussion of that proposal. This is one of the positive aspects of panel review – that a more broadly informed review of proposals is possible, and more coherent feedback is provided to investigators. Of course, it is not the intention of CISE to coerce panelists into changing their reviews. We will work with CISE program directors to make sure that the intent of this practice is understood by

panelists, and that panelists understand that divergent views on proposals are quite common and acceptable, especially when proposals describe high-risk research and education activities.

…in some cases the reviewers in theoretical foundations lacked the appropriate expertise, perhaps because the panels covered too broad a spectrum.

CISE is modifying its review procedures to recommend greater use of ad-hoc review in situations where proposal topics are not well-covered by panel expertise.

Management of CCF

The COV was impressed with the competence, dedication, outreach, and energy of the Division Director and Program Directors. The reorganization into clusters should increase the flexibility of the Program Directors to respond to changes in the distribution by area of research proposals and to fund new initiatives.

The program planning and prioritization process is rational but may suffer from anomalies in the cluster structure, which needs revision.

CCF intends to retain the concept of clusters, and is working to revise the cluster structure during FY07. Although the report does not specifically describe the anomalies in cluster structure, during the meeting we discussed cases in which disparate communities were combined in one cluster (e.g. Information Theory and Numerical Algorithms) and in which communities were split between two clusters (e.g. Quantum Information Theory). We hope to remove some of these anomalies without introducing others.

The COV observed that CCF Program Directors appear to be overwhelmed with the large number of proposals submitted each year. The COV thus recommends that the NSF hire additional program directors in areas with substantial number of proposals.

Federal budget constraints impose limits on the size of the CISE workforce. While the CISE proposal workload has increased by more than 100% in the past ten years, the number of staff within CISE has increased by approximately 10%. We continue to build a case for increased staffing levels, to maintain a full complement of staff at the level we have been granted, and to use hiring flexibilities granted to us as effectively as possible. Over the past year we have had success with part-time experts, and will continue to use this mechanism to increase our human capital capacity.

There should be greater transparency to the COV of budget allocation processes within CISE.

We in CCF are working toward greater transparency in budget development, primarily to give CCF staff the best information available to make decisions. In FY 05 we developed

a set of operating plan principles to guide budget development, which was made available to CCF staff. We can make this document available to the CISE Advisory Committee, and can make similar documents available to later COVs.

Budget planning documents for future fiscal years, however, do not circulate outside the government because of the preliminary and predecisional information they contain.

Award Portfolio and Impact

Award Quality and Funding Rate

The COV believes the overall quality of the funded proposals was excellent. However, the COV expressed significant concern about the large number of excellent yet unfunded proposals. Additionally, the funding amounts were often too small, particularly in Theory of Computing, where the amount was inadequate to support both a PI and a graduate student.

NSF receives more excellent proposals than it can fund in almost every area of science and engineering. We are working to increase the acceptance rate, both by working with the community to build a strong case for budget growth based on the increasing contributions that computing research and education make to society, and by limiting the number of proposals that overlap others. We are also encouraging collaborative research between the TF communities and other research communities through pathway programs such as SING. Researchers working in the intersection of several topics can draw on the NSF budgets allocated to any and all of those topics.

Program directors deal with the budget shortfall in many ways, depending on the area. Some try to provide small grants to a large number of investigators; others prioritize their proposals, which may result in a bias toward proposals from investigators who are already successful.

High-Risk Projects

In an environment with many high-quality proposals, the panel system may not encourage funding of high-risk proposals. The COV recommends that the NSF consider development of additional processes to identify and fund high-risk proposals.

If NSF is serious about funding high-risk research in a severely constrained funding environment, this criterion (along with a clearer definition) should be stressed in the instructions to panels, which could be asked to identify such proposals if they are not funded. An internal NSF mechanism could then be created to evaluate such proposals separately.

NSF's director understands the need to transcend science "as usual", and encourages risk-taking across the Foundation. NSF currently uses the SGER mechanism to allow

program directors to encourage and fund high-risk proposals. At present, program directors try to identify high-risk research and include some in their portfolios of projects. We have been making more use of SGERs for such projects, which bypasses panel review. In fact, CISE program directors use the SGER mechanism more frequently than program directors in any other directorate bar one. We agree with the CoV that stressing NSF's desire for high-risk projects to panelists would help us in identifying such projects, and will consider modifications to our review instructions.

Extending Promising Projects

There should be a mechanism for expanding research where very promising outcomes occur.

There are such mechanisms. We can supplement any award up to 25% of the original award amount for many reasons, including follow up on promising outcomes. In addition, SGER awards can provide up to $200,000 for exploratory research that may arise from promising outcomes. Finally, of course, a promising outcome might be the spark for a complete new proposal to NSF.

Maintaining US Leadership

There is concern that near term basic research (3-5 years) in wireless communications systems in the USA is lagging behind that of Europe and Asia. This problem should be addressed at the NSF wide level.

In the past years CISE has increased its attention to wireless communications, and we expect that increase to continue.

Multidisciplinary Projects

[While the EMT cluster] is interdisciplinary and addressing an important area, there are important opportunities within this area that may not be adequately emphasized. For example, there are critical research problems at the interfaces of quantum computing and condensed matter physics that are not being captured by this program. Similarly, proposals addressing problems at the intersection of biology and computer science may be perceived as being too biological by EMT (and too computer science centric by the BIO directorate)—creating a potential funding gap for important research.

Because ITR funding has now ended, the TF subcommittee is very concerned about how multidisciplinary research in TF areas will be covered within CISE in the future.

Multidisciplinary research of this type is a continual challenge for NSF. CISE is using several approaches simultaneously to continue the support of multidisciplinary research. The cluster organization is one approach, which encourages proposals that span the disciplines within one cluster. In our future year budget planning, we are considering directorate-wide programs that will facilitate these interactions. Finally,

multidisciplinary proposals are always welcome. Individual program directors are encouraged to interact with their peers throughout the organization to avoid funding gaps. We will continue to work to identify multidisciplinary opportunities and to support research and education in those areas.

Project Scale

The CPA subcommittee encourages the consideration of centers in CPA.

The COV noted that the budgets for EMT grants (at approximately 100K/year) are bigger than grants in other programs in CCF. However, the budgets need to be significantly larger overall for EMT to be successful. Importantly, there must be a mechanism for significant investment in the most promising new research to move it into a truly experimental phase.

In the case of theory of computing, the awards were typically about $ 70,000 per year. This was a deliberate policy aimed at sharing the limited resources as widely as possible. However, a $70,000 per year award is not sufficient to support a researcher and one student. As a consequence, Theory of Computing investigators often submitted multiple proposals to NSF, undesirably increasing the load on them and the review process. The problem of too small awards is less severe in other areas because fewer proposals were awarded.

All new program announcements from CCF will encourage large-scale projects, which may grow to the size of centers. We expect a mix of large and small scale projects as a result.

Research Initiation Awards

The TF subcommittee recommends complementing the highly selective CAREER program with a resurrected Research Initiation Award program. This program would provide smaller and shorter-term awards for promising new investigators.

This recommendation has been made by other COVs. We plan to encourage promising new investigators to submit proposals to every cluster announcement.

Measuring Impact

The COV recommends that CCF develop a method to track the number of students it supports.

This is a good idea, and should be possible through the annual reports filed by grantees. We will explore this idea.

Overall, the COV thinks that idea outcomes from the CCF division are satisfactory but difficult to collect and evaluate.

We agree with the COV's opinion of our idea outcomes, and share the concern about difficulties in collection and evaluation. NSF as a whole continues to refine its nugget system, which is the primary mechanism for collecting and evaluating these outcomes. CCF will participate actively in this refinement process.

Tools and infrastructure are vital components of the NSF mission. Many projects contribute to this through the development of software that is made available for general use. These deserve continued encouragement and support. It was difficult to identify such projects and the facilities they provide from the data made available to the COV. However, PIs typically integrate their research and resulting tools into their teaching activities. Sometimes this material is made available to others through open courseware. Such material constitutes a significant asset and open access to these should continue to be supported. The COV recommends developing mechanisms to monitor the effect of these activities to further improve their outreach.

NSF has several mechanisms in place for tracking the effects of research on infrastructure. One is the nugget system, which continues to improve every year since its inception in 2003. CCF will be actively involved in the continuing improvement of this system, which will provide better tracking of all outcomes of NSF projects. Another method is a CISE program, Computing Research Infrastructure, which provides funds specifically to develop or acquire infrastructure. As research tools transition to infrastructure, some of them are supported through CRI. Still another mechanism is the annual reports submitted by grantees. When we analyze whether we can use these reports for tracking graduate students as recommended above, we will also analyze what other outcomes we can extract from them.

Educational Projects

The CPA subcommittee recommends that CISE support the Open Courseware activity.

We welcome proposals for support of OpenCourseware.

CCF/CISE should consider taking a more active role in the allocation of NSF graduate fellowships by assisting the EHR Directorate in the review process.

CCF has begun a dialogue with EHR on graduate fellowships, and will continue that dialogue.

Outreach

CPA is funding an appropriate percentage of proposals received from women and minorities, but the number of proposal submissions needs to be increased.

We will continue to reach out to those communities through site visits, invitations to review, NSF Regional Grants Conferences, and other mechanisms. We expect a new CISE program, Broadening Participation in Computing, to lead to more proposals from these communities. In addition, we of course rely on the CCF community to support and nurture faculty from underrepresented groups and institutions.

Community Interactions with NSF

The CPA subcommittee is concerned about replacing the highly successful FASTLANE with GRANTS.Gov, which is not tailored to the support the missions of basic research, a distinguishing characteristic of NSF.

The staff of NSF is concerned about this too, and is actively working to ensure that Grants.gov will be suitable for NSF.

While we recognize that mandated programs and programmatic commitments must enter the funding equation, we urge creation of a mechanism that allows the broader academic community to express its views on funding priorities to CISE.

The newly established Computing Community Consortium (CCC) is intended as a mechanism for broad community involvement with CISE priorities. We welcome communication from anyone in the community on how to ensure representation of all parts of the community in the CCC.

COV Organization

The COV found the COV review process to be challenging because of several organizational issues, and recommends that the following be considered for any future reviews: Before the review. The COV encourages CCF and all CISE divisions to have the COV chair and Cochairs arrive a day early to review the available materials, meet with the division staff, and prepare for the meeting to ensure the COV objectives are clear and that the meeting is planned accordingly. The COV also expressed an interest in participating in a teleconference a few weeks before the COV meeting to clarify the COV goals and objectives, and to ensure that materials are made available for early analysis and discussion.

Structure of meeting. The COV encourages CCF to consider extending the COV meeting time to three days in the future (as some other NSF Directorates do) to ensure that the COV has adequate time for discussion and preparation of recommendations and the final report. Ideally, on the first day, there would be a full day of presentations by the CCF staff in which the data needed to give proper consideration to each question are provided. On the second day, the morning could be devoted to the breakout sessions by the subcommittees followed by follow-up presentations by the CCF staff in response to requests for additional information/clarification by the COV.

Availability of data. The availability of data and additional time would have enabled the COV to engage in more deep, strategic thinking rather than devoting a large portion of the time attempting to find data or requesting data from the CCF staff. Additionally, it would be helpful to have access to the annual reports and final reports for the awarded proposals for proper consideration of the "outcome" questions (found in Part B of the Report Template, which is reproduces in Appendix 3).

For future reference, CCF should go over all the questions asked in the COV report and prepare the data and statistics needed to answer them. COV should have access to all the awarded proposals. The outcome component of the COV evaluation report should be based on a review of the final reports of the projects that have ended during the evaluation period. The COV should have access to the final and progress reports for these projects as well as the progress reports of active projects.

We learn something from every COV about how to conduct these reviews more effectively. NSF now has an agency-wide COV coordinator, as well as a growing base of experience. The recommendations above about preliminary meetings, conferences, and meeting length will be passed on to our COV coordinator, for consideration in planning other COVs. Completeness of the review must be balanced against time commitments from both the agency and outside reviewers.

Our information systems continue to improve at a rapid rate. Data availability in this COV, using electronic records, was improved over previous years, in which selected paper files were supplied. The tools are admittedly not perfect, so some access problems and user interface quirks became evident. We have passed these on to our Division of Information Systems, which will improve the systems with subsequent releases.

We intend to precede future COVs with a detailed collection and summarization of all of the data needed to answer the COV questions. This recommendation has been passed on to our agency COV coordinator for agency-wide consideration.